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**UTILITY
PATENT APPLICATION
TRANSMITTAL**

Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. TER2-BD91

First Inventor or Application Identifier Ronald R. Kelly Et al

Title IMPROVED TRACKING, PROPULSION AND...

Express Mail Label No. EL063611370US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. Specification [Total Pages 9]
 - Descriptive title of the Invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. Drawing(s) (35 U.S.C. 113) [Total Sheets 8]
4. Oath or Declaration [Total Pages 2]
 - a. Newly executed (original or copy)
 - b. Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 17 completed)
[Note Box 5 below]
 - i. DELETION OF INVENTOR(S)
Signed statement attached deleting
inventor(s) named in the prior application,
see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

5. Incorporation By Reference (useable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered to be part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

17. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment

Continuation Divisional Continuation-in-part (CIP) of prior application No: _____

Prior application Information: Examiner _____ Group / Art Unit: _____

18. CORRESPONDENCE ADDRESS

<input type="checkbox"/> Customer Number or Bar Code Label <i>(Insert Customer No. or Attach bar code label here)</i>		or <input checked="" type="checkbox"/> Correspondence address below		
Name	Franklin D. Ubell, Reg. 27,009			
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Address	2100 S.E. Main Street, Suite 250			
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Name (Print/Type)	Franklin D. Ubell	Registration No. (Attorney/Agent)	27,009
Signature	8-7-98		

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FEE TRANSMITTAL

Patent fees are subject to annual revision on October 1.

These are the fees effective October 1, 1997.

Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12. See 37 C.F.R. §§ 1.27 and 1.28.

TOTAL AMOUNT OF PAYMENT (\$ 395.00)

Complete If Known

Application Number	
Filing Date	
First Named Inventor	
Examiner Name	
Group / Art Unit	
Attorney Docket No.	TER2-BD91

METHOD OF PAYMENT (check one)

1. The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account 16-2462
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Deposit Account Name PRICE, GESS & UABELL

Charge Any Additional Fee Required Under 37 C.F.R. §§ 1.16 and 1.17 Charge the Issue Fee Set in 37 C.F.R. § 1.18 at the Mailing of the Notice of Allowance

2. Payment Enclosed:

Check Money Order Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
101 790	201 395	Utility filing fee	395
106 330	206 165	Design filing fee	
107 540	207 270	Plant filing fee	
108 790	208 395	Reissue filing fee	
114 150	214 75	Provisional filing fee	
SUBTOTAL (1) (\$)		395	

2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
9	-20** = 0	X 11	= 0
Independent Claims 2	- 3** = 0	X 41	= 0
Multiple Dependent			= 0

** or number previously paid, if greater; For Reissues, see below

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
103 22	203 11	Claims in excess of 20
102 82	202 41	Independent claims in excess of 3
104 270	204 135	Multiple dependent claim, if not paid
109 82	209 41	** Reissue independent claims over original patent
110 22	210 11	** Reissue claims in excess of 20 and over original patent
SUBTOTAL (2) (\$)		0.00

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
105 130	205 65	Surcharge - late filing fee or oath	
127 50	227 25	Surcharge - late provisional filing fee or cover sheet	
139 130	139 130	Non-English specification	
147 2,520	147 2,520	For filing a request for reexamination	
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	
113 1,840*	113 1,840*	Requesting publication of SIR after Examiner action	
115 110	215 55	Extension for reply within first month	
116 400	218 200	Extension for reply within second month	
117 950	217 475	Extension for reply within third month	
118 1,510	218 755	Extension for reply within fourth month	
128 2,060	228 1,030	Extension for reply within fifth month	
119 310	219 155	Notice of Appeal	
120 310	220 155	Filing a brief in support of an appeal	
121 270	221 135	Request for oral hearing	
138 1,510	138 1,510	Petition to institute a public use proceeding	
140 110	240 55	Petition to revive - unavoidable	
141 1,320	241 660	Petition to revive - unintentional	
142 1,320	242 660	Utility issue fee (or reissue)	
143 450	243 225	Design issue fee	
144 670	244 335	Plant issue fee	
122 130	122 130	Petitions to the Commissioner	
123 50	123 50	Petitions related to provisional applications	
126 240	126 240	Submission of Information Disclosure Stmt	
581 40	581 40	Recording each patent assignment per property (times number of properties)	
146 790	246 395	Filing a submission after final rejection (37 CFR 1.129(a))	
149 790	249 395	For each additional invention to be examined (37 CFR 1.129(b))	

Other fee (specify) _____

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$)

Complete (if applicable)

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SPECIFICATION, CLAIMS AND ABSTRACT

Inventor(s): Ronald R. Kelly et al.

Title: IMPROVED TRACKING, PROPULSION
AND BRAKING SYSTEM FOR
BRIDGE TRIPPER/HOPPER CAR

Attorney's
Docket No.: TER2-BD91

EXPRESS MAIL LABEL NO. EL063611370US

DATE OF DEPOSIT: August 7, 1998

PATENT APPLICATION

TER2-BD91

**IMPROVED TRACKING, PROPULSION AND
BRAKING SYSTEM FOR
BRIDGE TRIPPER/HOPPER CAR**

Ronald R. Kelly
George M. Bernard

IMPROVED TRACKING, PROPULSION AND BRAKING SYSTEM FOR BRIDGE TRIPPER/HOPPER CAR

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The subjection relates generally to material moving apparatus and more particularly to improvements in belt trippers or hoppers which ride on a conveyor assembly.

10 2. Description of Related Art

15 A conventional belt tripper 11 is illustrated in Figure 1. Such a belt tripper 11 typically travels up and down railroad tracks located on top of a long movable conveyor 13 as shown in Figure 2. The tripper 11 functions to "trip" material off the long conveyor 13 to a short conveyor 15, which builds a stack of material 17. Apparatus known as "hoppers" are also similarly arranged to move up and down conveyors such as conveyor 13 to carry material along the conveyor. Trippers and hoppers of conventional design have exhibited numerous drawbacks.

20 First, conventional trippers/hoppers 11 ride on rail wheels 17, as shown in Figure 3. Typical rail wheels 17 have a flange 18 running on the inside of the rail 19. These flanges 18 help guide and align the wheel 17 along the track, but are subject to derailment if the track is not even. This poses a serious safety concern: since it permits the tripper/hopper to derail, i.e., come off the top of the bridge 13.

25 Current equipment designs further use a pad type brake 21, Figure 4, that applies pressure to the top of the rail 17, using the weight of the tripper/hopper car. This design is similar to the braking system used on old trolley cars. The amount of friction developed is proportional to the weight of the machine and the spring tension.

 Current equipment designs use dual wire ropes running the length of the bridge 13 that wrap around capstans on the tipper/hopper. Propulsion of the

tripper/hopper is achieved by powering the capstans. Several problems exist with this system. With wire rope (cables), stretch is experienced as tension is applied through the capstans. The tripper/hopper's mass, plus the differential forces produced by the belt tensions, have to be overcome or resisted by the wire ropes. Overcoming the wire 5 rope's stretch produces a jerky propulsion movement.

In addition, since the tensions on the wire rope can become different from side to side, the resulting forces can create racking and potentially can derail the tripper/hopper. The same difficulty could be experienced if one of the cables breaks. As stated above, only the flanges of the rail wheels keep the current design on the 10 rails, and if it derails, the brakes are useless.

SUMMARY OF THE INVENTION

According to the invention, wheels are placed on three sides of a wheel runway at each of four drive points. On the top of each drive point there is a drive 15 wheel. On the underside of the runway is a holddown wheel. In addition, side wheels are provided for wheel system for alignment. This mechanism makes it virtually impossible for a tripper/hopper to come off the top of the bridge.

According to another inventive aspect, a motor and motor brake are placed on each of the four drivewheels of the tripper or hopper. The motor brake 20 utilizes the reduction of a drive gearbox to increase the effective braking torque developed. Any one brake is designed to hold the machine.

The design is an "active" design, which provides increased safety factors and redundancy in the tracking system and the braking system. In addition, for 25 added safety, a secondary "Fail Safe" brake system may be provided. The Fail Safe brake system incorporates two clamping type "rail" brakes to each tripper/hopper. Any time the propulsion system or power is turned off, the clamp brakes set and lock on the top chord of the bridge structure.

BRIEF DESCRIPTION OF THE DRAWINGS

The exact nature of this invention, as well as its objects and advantages, will become readily apparent upon reference to the following detailed description when considered in conjunction with the accompanying drawings, in which like reference numerals designate like parts throughout the figures thereof, and wherein:

Figure 1 is a side view outlining a prior art belt tripper;

Figure 2 is a perspective view illustrating an environment wherein a belt tripper may find use;

10 Figure 3 is a fragmented cross sectional view illustrating a prior art belt
tripper wheel mechanism;

Figure 4 is a fragmented cross sectional view illustrating a prior art belt tripper brake mechanism;

15 Figure 5 is a cross sectional view illustrating belt tripper tracking and
braking apparatus useful according to the preferred embodiment; and

Figure 6 is a perspective view illustrating a drive motor apparatus useful according to the preferred embodiment;

Figure 7 is a perspective view illustrating presently preferred positioning and mounting of components illustrated in Figures 5 and 6; and

Figure 8 is a top schematic view taken at 8-8 of Figure 7.

DETAILED DESCRIPTION
OF THE PREFERRED EMBODIMENTS

25 Certain preferred features of the improved tracking, propulsion and
braking systems are shown in Figure 5. These features include a wheel tire 31 riding on
one of two structural T-section rails 34, which typically comprise the top chord of a
bridge truss, e.g., Figure 1. The wheel tire 31 is relatively wide and of a larger diameter
than the conventionally used rail wheels. Such tires assist in negotiating uneven
surfaces and provide ease of mobility.

The wheel 31 is mounted on a rim structure 31, which attaches to a plate 28 affixed to an axle 33. The axle 33 is journaled in a vertical support 35 to which the belt tripper superstructure including its cab are attached.

A hydraulic brake assembly 37 is further shown welded or otherwise 5 attached to the vertical support 35 by means of a channel 36, which is angled 90 degrees, such that its hollow rectangular channel structure 38 is visible in Figure 5. The brake 37 includes first and second calipers 39, 41 mounting respective first and second brakes shoes 43, 45. The brake assembly 37 then acts like a disc brake and provides a "Fail Safe" feature as described herein.

10 On the outside of the T-section 34 are mounted a caster guide wheel 53 and a hold down roller wheel 59. A piece of angled channel 47 extends around the wheel 31 and is welded or otherwise affixed to the support 35. A suspending post 51 suspends a u-shaped caster mounting bracket 53 wherein the caster wheel 55 is rotatably mounted on a vertically disposed shaft 54, such that wheel 55 rotates in a horizontal 15 plane adjacent the vertical edge 56 of the T-section 34 and spaced apart therefrom.

Mounted beneath the bracket 53, either by attachment thereto or to post 51, is a strut 57 into which the roller wheel 59 is journaled. The roller wheel 59 is positioned immediately adjacent the underside edge of the structural T-member with a clearance of, for example, one-half inch. Such roller wheels 59 hold the belt tripper in 20 position and preclude it from tipping off the track 34, while the caster guide wheel 55 further assists in holding the wheel tire 31 in place. With this construction it becomes highly improbable that the tripper will come off the bridge.

Figure 6 illustrates the motor drive mount employed according to the preferred embodiment. As shown, an electric motor drive unit 60 is attached to drive 25 each of the four wheel tires 31. The motor drive unit 60 includes a multi reduction, shaft-mounted gearbox 63, a motor 65 and an integral electric motor brake 67 with a Fail Safe, spring set electric release 69. The unit 60 is mounted to the wheel shaft 33 (Figure 5) by means of a hollow shaft with shaft mount drive.

Thus, a motor brake 67 is provided on each of the four drive wheels 31. 30 This brake utilizes the reduction of each drive gearbox 63 to increase the effective

braking torque developed. Any one brake 67 is preferably designed to be sufficient to hold the machine. In order to increase the safety factor and redundancy of the braking system, each wheel drive incorporates an individual brake. For additional redundancy and safety, two hydraulic brakes 37 are provided. Any time the propulsion system or 5 power are turned off, the Clamp Brake will set and lock on to the inside flange of the top chord of the bridge structure.

The electric motor drive units 60 preferably provide Variable Frequency Drives at all four wheels through a multi reduction gearbox to apply smooth, even propulsion to the tripper/hopper. Through use of state of the art electrical controls, the 10 VFD's produce 100% torque throughout the frequency range of one to 50 hertz. The VFD allows the tripper/hopper to ramp up to travel speed smoothly and ramp down to a stop. The brakes then immediately set on each motor and the clamping brakes apply. The multiple output VFD controls and measures frequency and torque being applied to each drive motor. A main advantage of the motor drive system is that it provides a 15 smooth propulsion system with the result that spills are minimized.

Figures 7 and 8 illustrate a presently preferred scheme for positioning the tracking, propulsion and braking components of Figure 5 and 6 on a belt tripper structure 71. Figure 7 illustrates one side of the belt tripper. The opposite side is similarly constructed.

20 As shown in Figure 7, a brake assembly 37 is suspended from a horizontal structural member 73 by attachment to a vertical member 72. The brake assembly 37 is centrally positioned between first and second wheel tires 31, which are driven by respective motordrive units 60. These two motordrive units 60 are each attached to the belt tripper structure 71 through use of respective pillow block bearings 25 75. The bearings 75 are attached to the underside of respective horizontal structural members 77, 79, via bolts, welding or other conventional attachment means.

As best seen in Figure 8, each caster sidewheel 55 is positioned between the motordrive unit 60 and the structural T-section 34 of the bridge truss. Respective 30 caster mounting brackets 53 are suspended from the respective horizontal members 77, 79 by respective arms 81 which are in turn attached to an adapter bracket or transition

bracket 83. The roller wheels 59 are similarly suspended from members 77, 79 and are each positioned spaced apart from and adjacent to a respective pillow block bearing 75.

Those skilled in the art will appreciate that various adaptations and modifications of the just-described preferred embodiment can be configured without departing from the scope and spirit of the invention. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced other than as specifically described herein.

CLAIMS

What Is Claimed Is:

1. The apparatus comprising:
2. a conveyer structure, including first and second T-sections;
3. a car adapted to ride on said conveyor structure, said car comprising:
 4. (a) two pairs of wheel tires positioned to ride on said first
5. and second T-sections respectively, each wheel tire being driven by a
6. respective motor drive unit, each drive unit including an electric motor,
7. an electric motor brake and a shaft-mounted gearbox;
 8. (b) four caster guide wheels each mounted adjacent a
9. respective one of said wheel tires so as to rotate in a horizontal plane
10. adjacent a vertical edge of one of said first and second T-sections; and
 11. (c) four roller wheels, each mounted to rotate about an axis
12. parallel to the axis about which said wheel tires rotate and immediately
13. adjacent an underside edge of one of said first and second T-sections
1. 2. The apparatus of Claim 1 further comprising:
2. first and second hydraulic caliper brakes each having respective brake
3. shoes positioned to engage a respective one of said T-sections.
1. 3. The apparatus of Claim 1 wherein said car comprises a belt tripper.
1. 4. The apparatus of Claim 1 wherein said car comprises a hopper.

1 5. The apparatus comprising:

2 a car adapted to ride on first and second T-sections of a conveyer
3 structure, said car comprising two pairs of wheel tires positioned to ride
4 on said first and second T-sections respectively, each wheel tire being
5 driven by a respective motor drive unit, each drive unit including an
6 electric motor, an electric motor brake and a shaft-mounted gearbox.

1 6. The apparatus of Claim 5 wherein said car further comprises:

2 four caster guide wheels each mounted adjacent a respective one
3 of said wheel tires so as to rotate in a horizontal plane adjacent a
4 vertical edge of one of said first and second T-sections;
5 four roller wheels, each mounted to rotate about an axis parallel
6 to the axis about which said wheel tires rotate and immediately
7 adjacent an underside edge of one of said first and second T-
8 sections.

1 7. The apparatus of Claim 6 further comprising:

2 first and second hydraulic caliper brakes each having respective
3 brake shoes positioned to engage a respective one of said T-
4 sections.

1 8. The apparatus of Claim 5 wherein said car comprises a belt tripper.

1 9. The apparatus of Claim 5 wherein said car comprises a hopper.

ABSTRACT OF THE DISCLOSURE

A tripper/hopper car rides on a conveyor via four wheel tires running on a T-section rails, with respective hold down wheels riding adjacent the underside of the rails and respective caster side wheels riding adjacent the vertical edges of the T-rails. Each wheel tire is driven by a motor drive unit employing a shaft-mount gearbox with a motor brake that utilizes the reduction of the drive gearbox to increase the effective braking torque developed. A pair of caliper-type brakes is further provided for redundancy.

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DRAWINGS (8 SHEETS)

Inventor(s): Ronald R. Kelly et al.

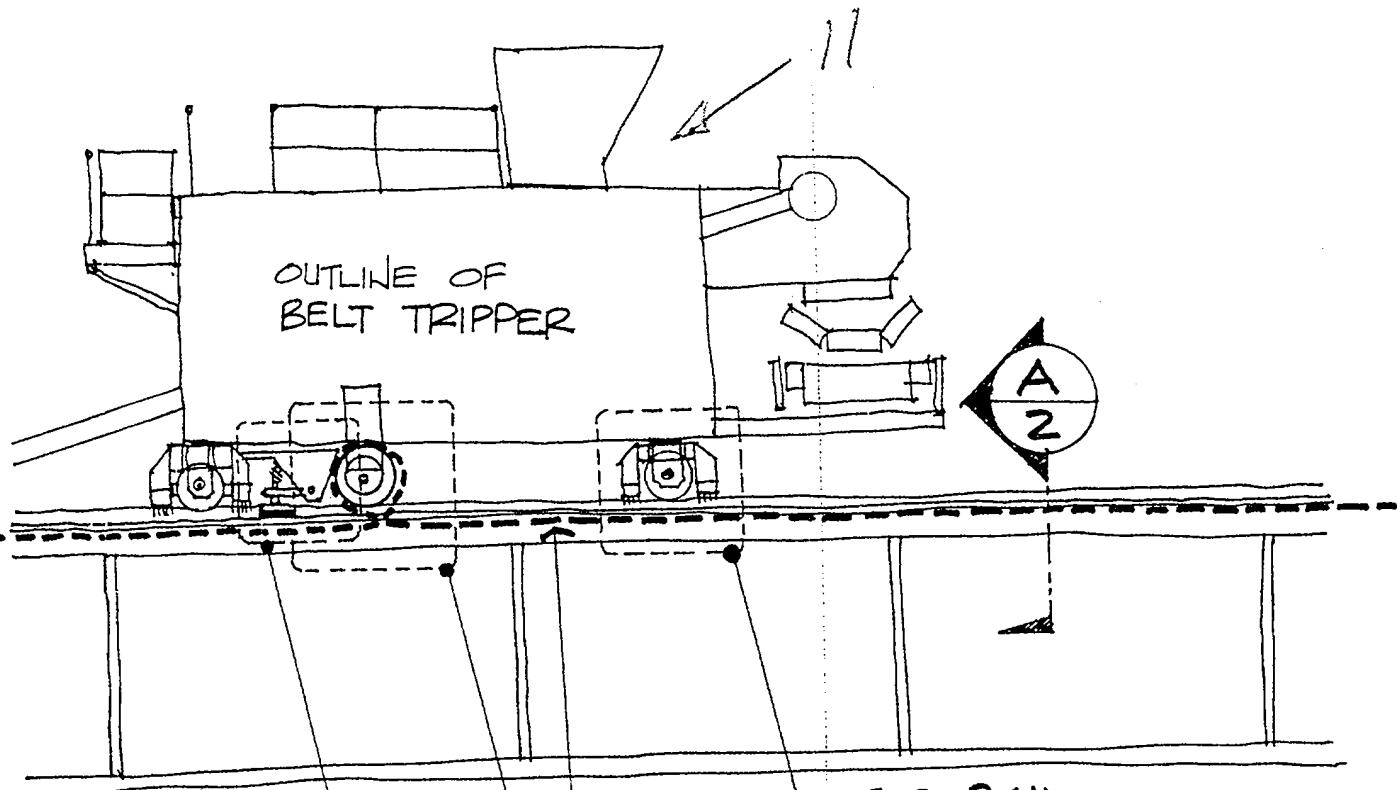
Title: IMPROVED TRACKING, PROPULSION
AND BRAKING SYSTEM FOR
BRIDGE TRIPPER/HOPPER CAR

Attorney's
Docket No.: TER2-BD91

EXPRESS MAIL LABEL NO. EL063611370US

DATE OF DEPOSIT: August 7, 1998

FIG. 1
PRIOR PART



**TYP. RAIL
WHEEL SUPPORT**
(TYPICAL TO 4)
NOT DRIVEN, SEE SECTION

A
2

CAPSTAN
PROPELLING MECHANISM &
TENSION WIRE CABLE

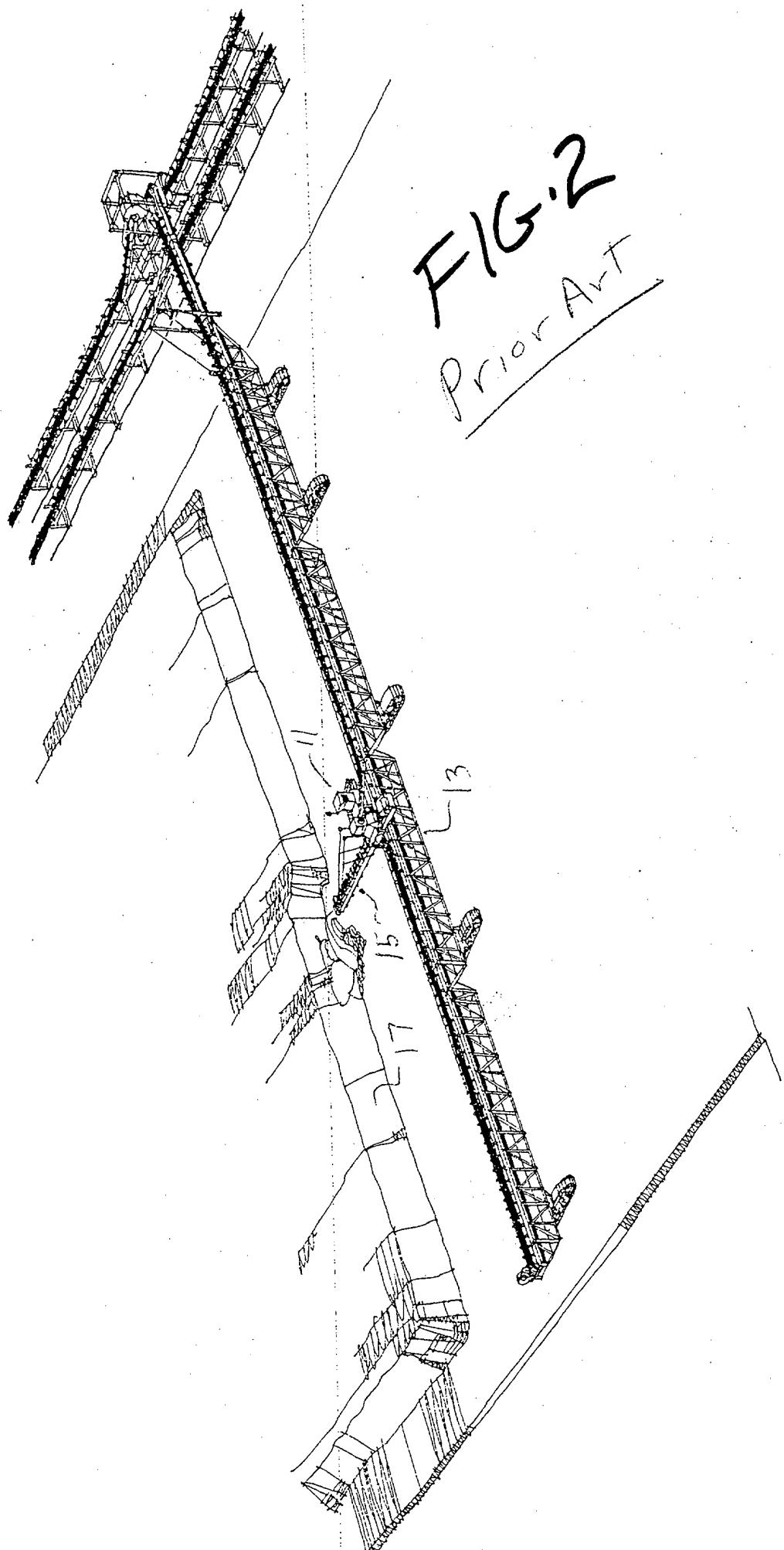
BRAKE SYSTEM
'SKID' PRESS ACTION
SEE SECTION

B
3

KEY ELEVATION

00000000000000000000000000000000

FIG. 2



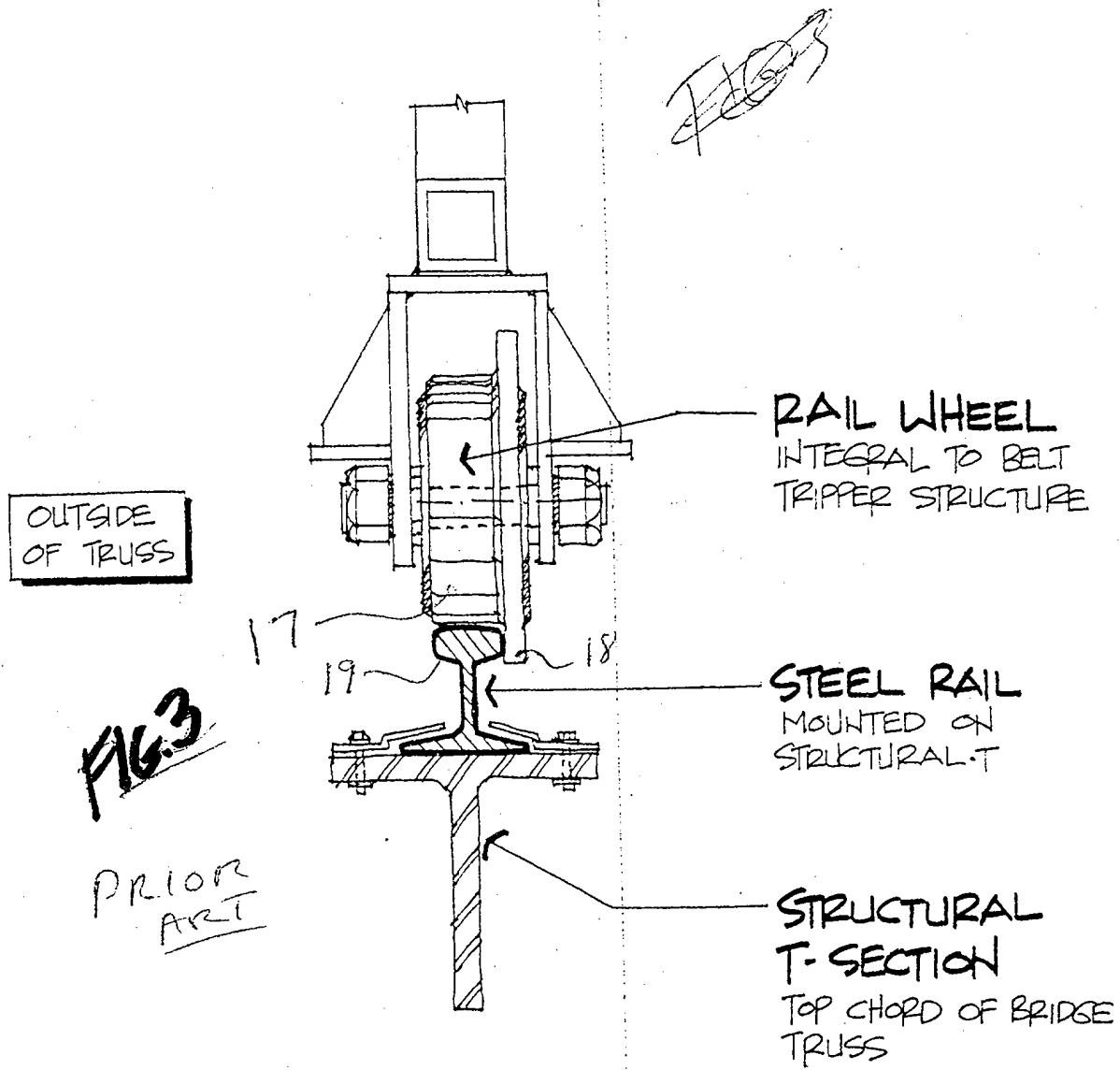


FIG 4

PRIOR
ART

OUTSIDE
OF TRUSS

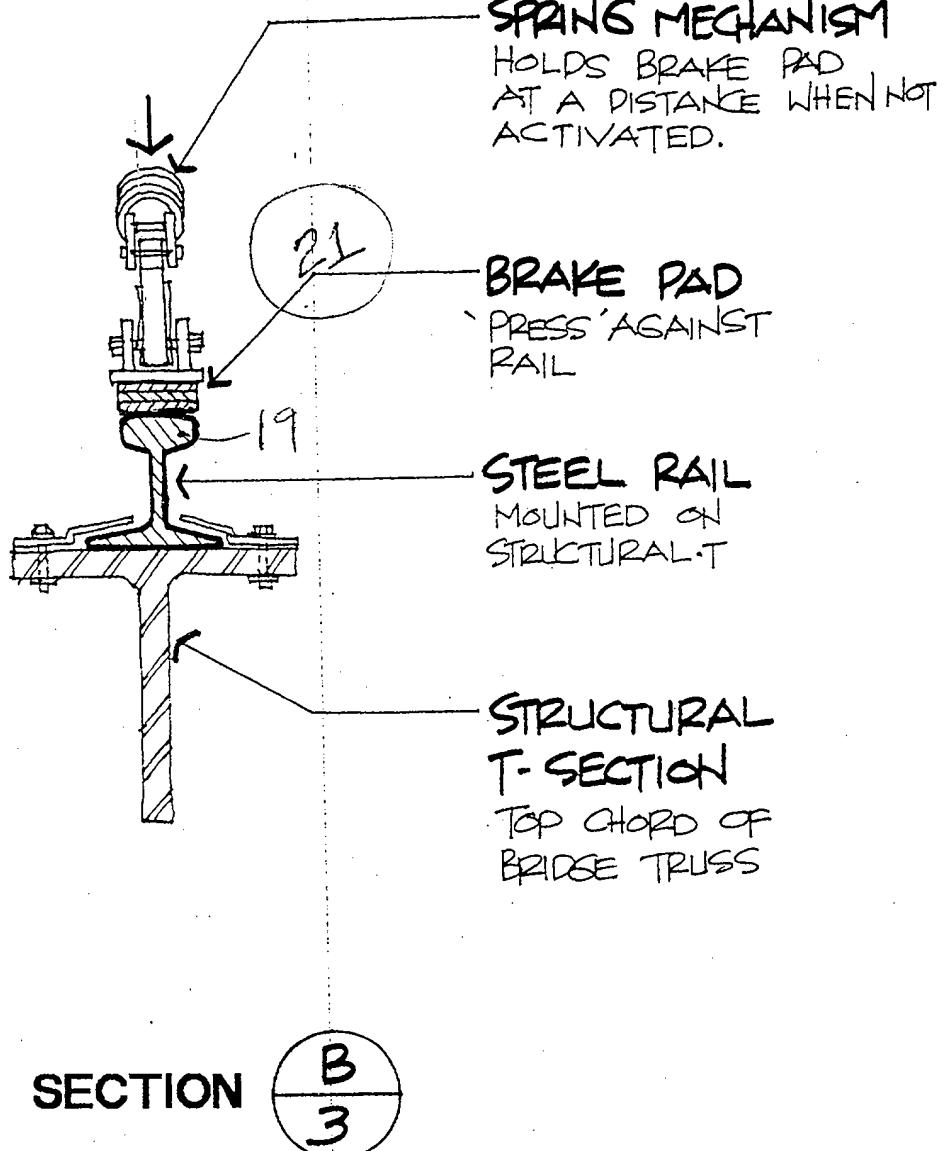
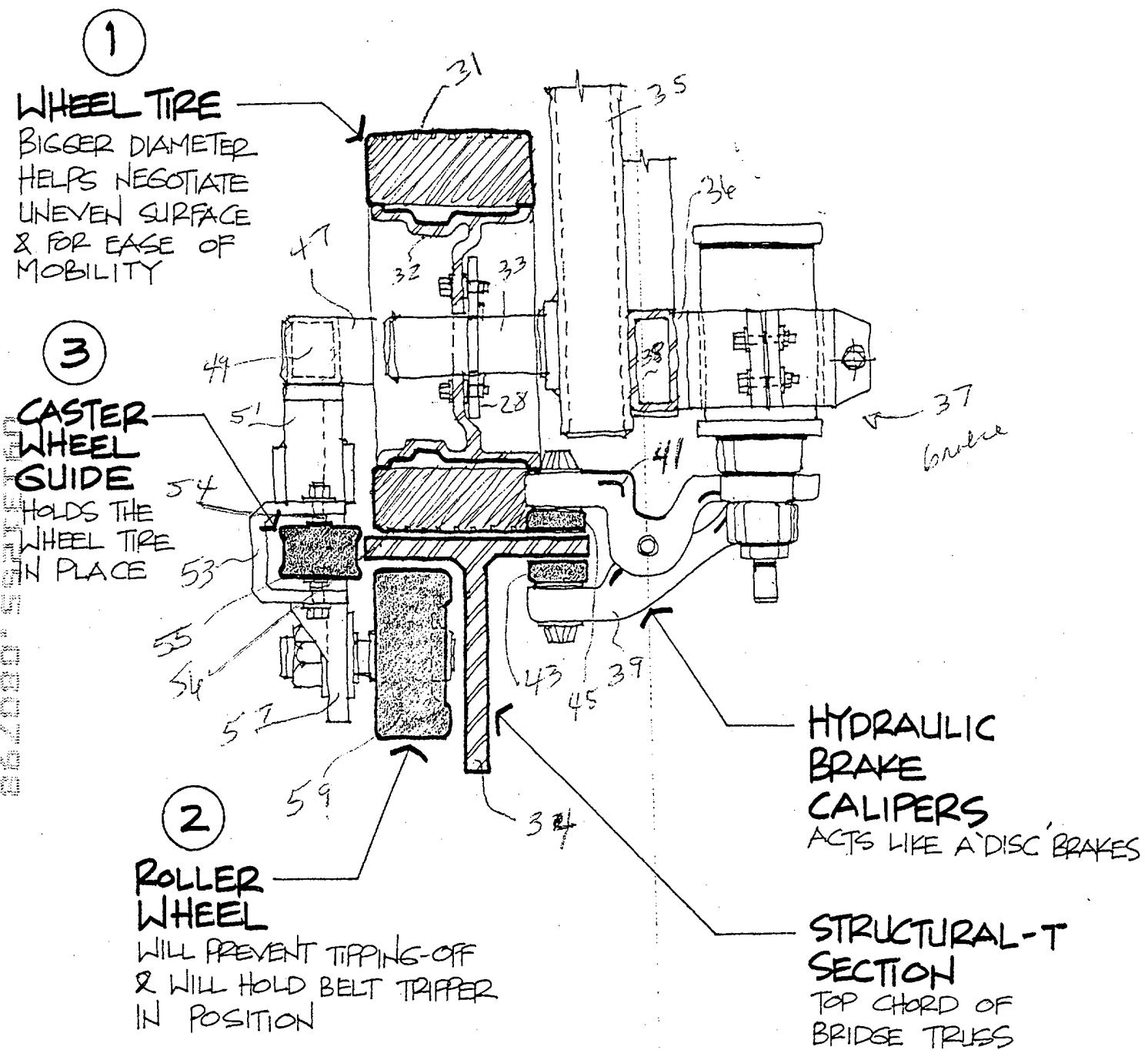


FIG 5



3 POINT SUPPORT SYSTEM

FIG. 6

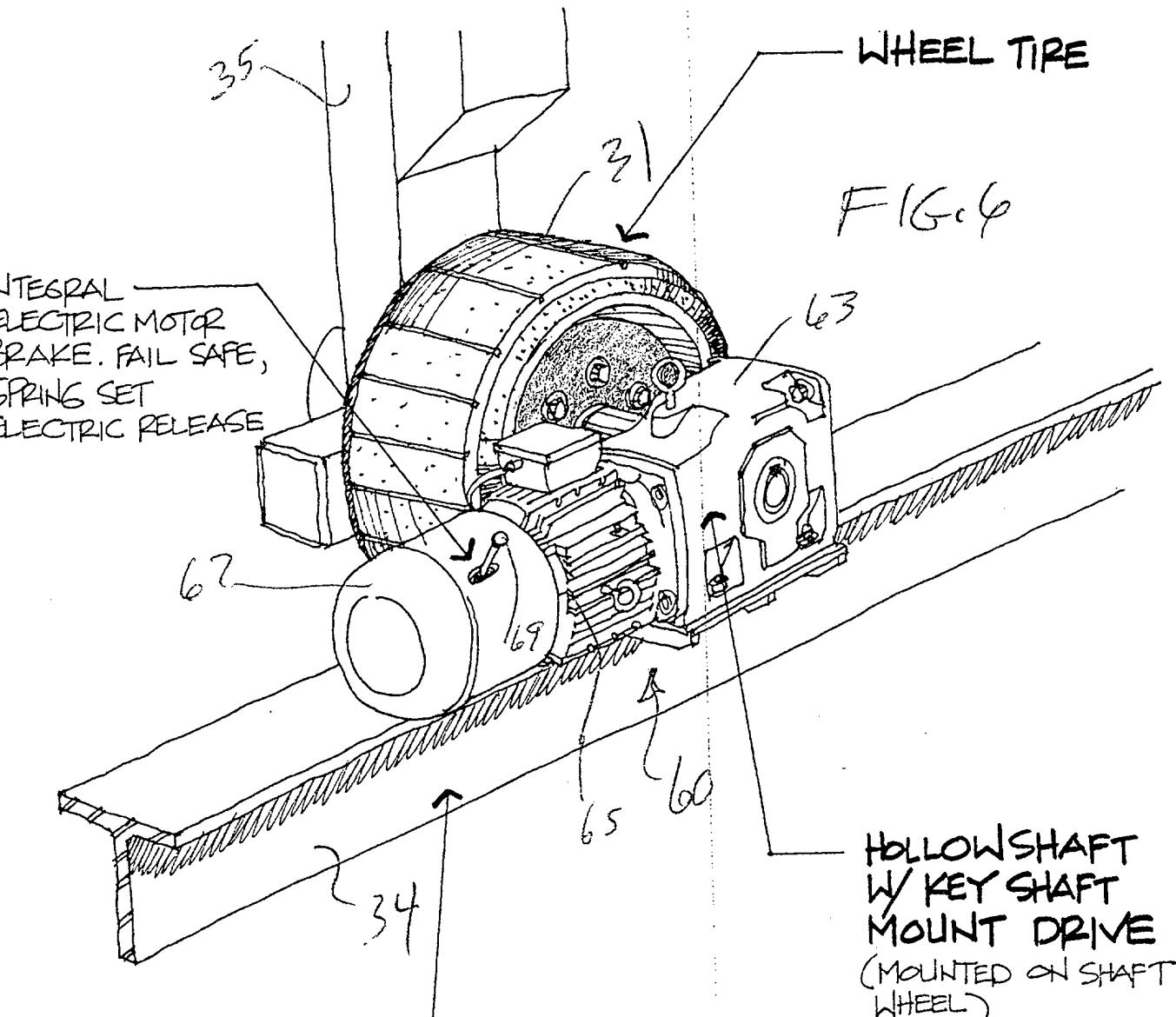


FIG. 6

DRIVE MOTOR MOUNT

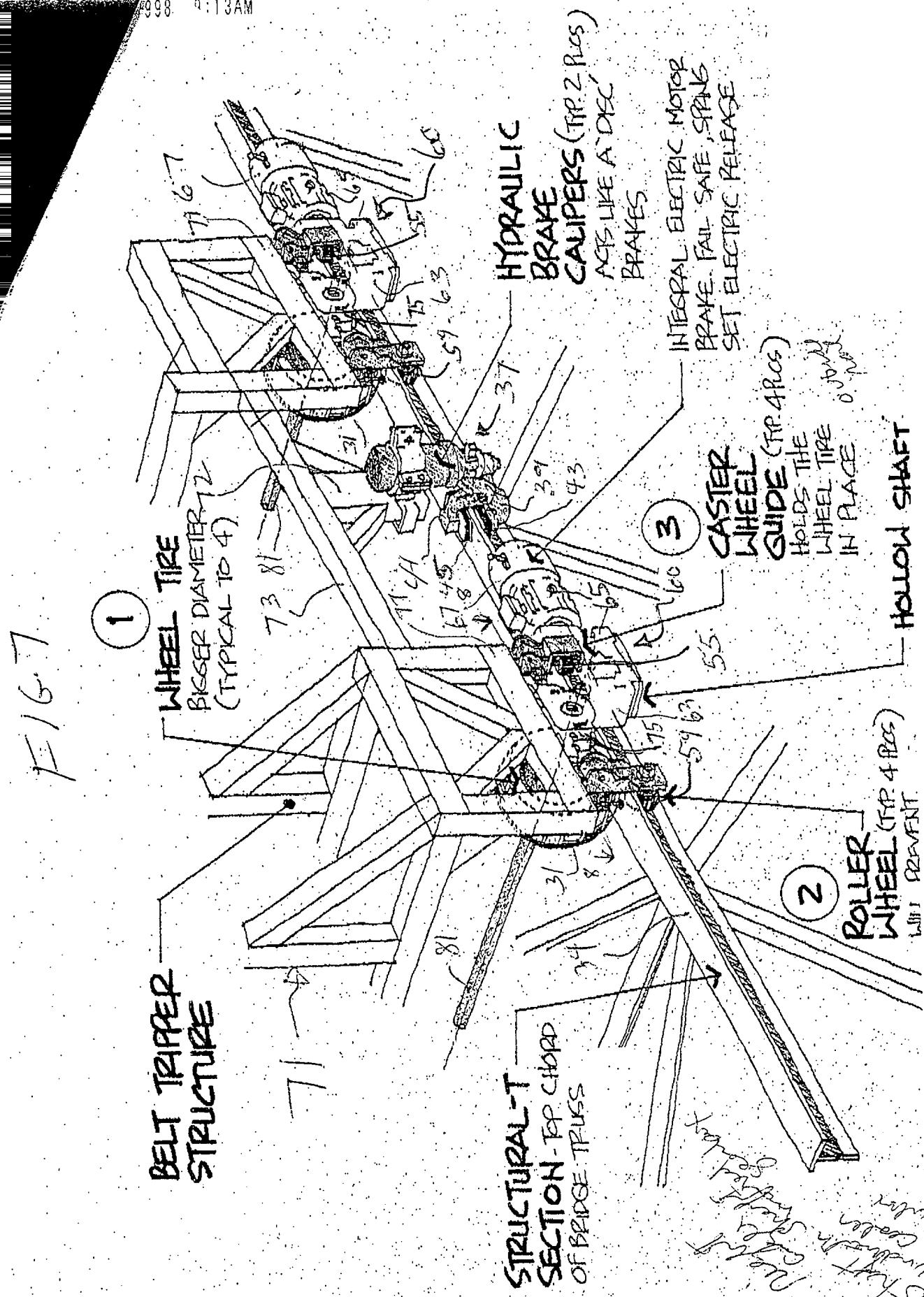
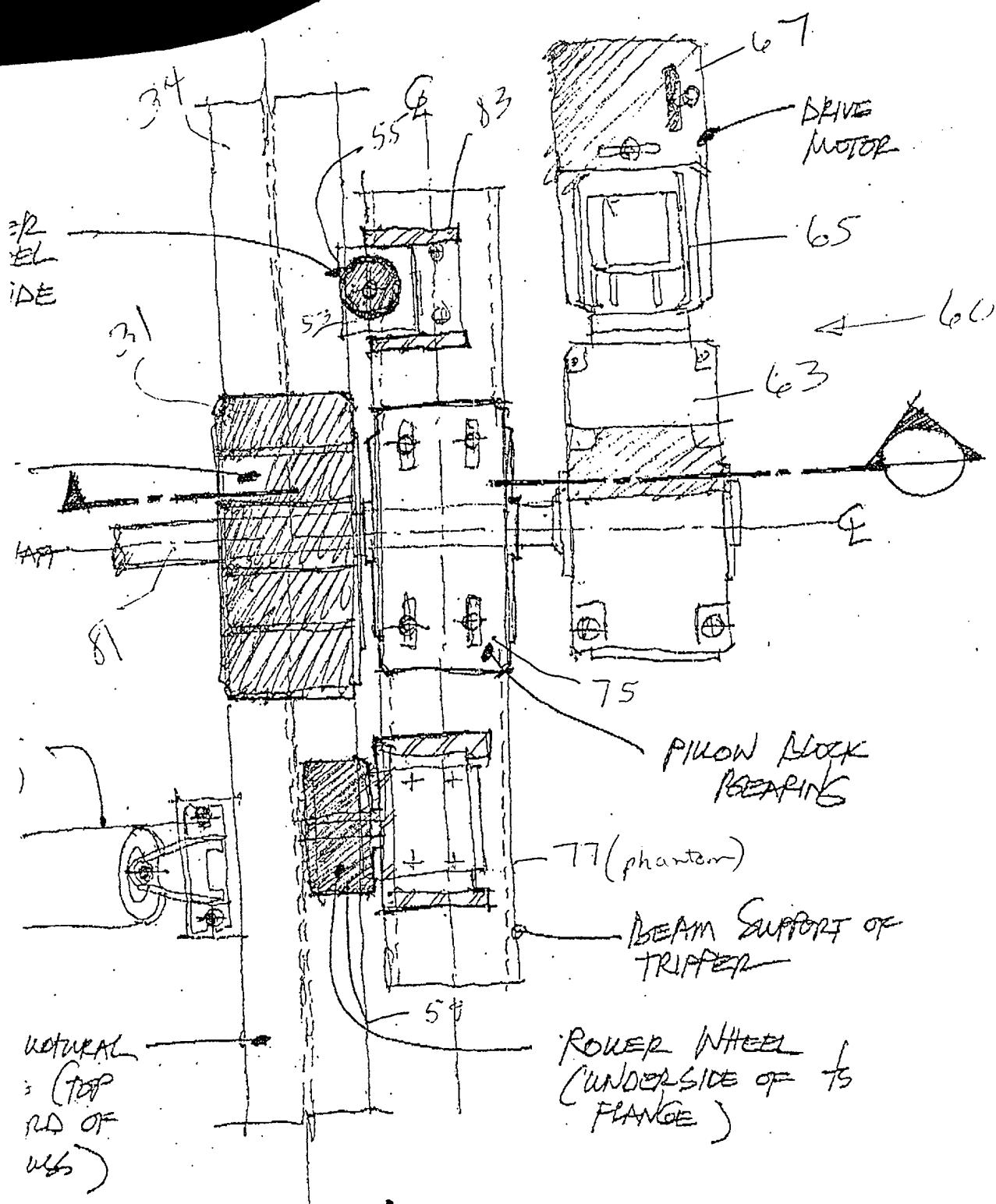


FIG 8



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DECLARATION AND POWER OF ATTORNEY

Inventor(s): Ronald R. Kelly et al.

Title: IMPROVED TRACKING, PROPULSION
AND BRAKING SYSTEM FOR
BRIDGE TRIPPER/HOPPER CAR

Attorney's
Docket No.: TER2-BD91

EXPRESS MAIL LABEL NO. EL063611370US

DATE OF DEPOSIT: August 7, 1998

COMBINED DECLARATION AND POWER OF ATTORNEY
IN ORIGINAL APPLICATION

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verify believe that I am the original, first and sole inventor (if only one name is listed below) or joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought, entitled:

IMPROVED TRACKING, PROPULSION AND BRAKING SYSTEM FOR
BRIDGE TRIPPER/HOPPER CAR

the specification of which:

(check one)

is attached hereto.

was filed on _____ as

Application Serial No. _____

and was amended on _____

(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Foreign application(s), if any, for Patent or Inventor's Certificate Filed Within 12 Months Prior to the Filing Date of This Application:

Country	Application No.	Date of Filing (day, month, year)	Priority Claimed Under 35 U.S.C. 119
			Yes _____ No _____
			Yes _____ No _____
			Yes _____ No _____
			Yes _____ No _____
			Yes _____ No _____
			Yes _____ No _____

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Country	Application No.	Date of Filing

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in a manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

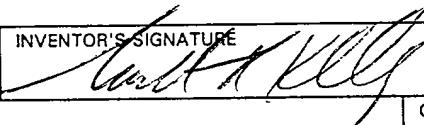
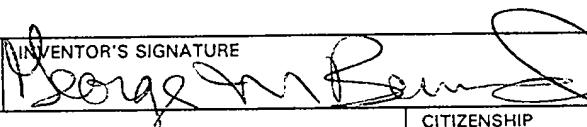
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Gordon E. Gray, III (Reg. 42,602)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issued thereon.

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RESIDENCE		CITIZENSHIP	
POST OFFICE ADDRESS			
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VERIFIED STATEMENT (DECLARATION)

CLAIMING SMALL ENTITY STATUS

Inventor(s): Ronald R. Kelly et al.

Title: IMPROVED TRACKING, PROPULSION
AND BRAKING SYSTEM FOR
BRIDGE TRIPPER/HOPPER CAR

Attorney's
Docket No.: TER2-BD91

EXPRESS MAIL LABEL NO. EL063611370US

DATE OF DEPOSIT: August 7, 1998

Applicant or Patentee: RONALD R. KELLY and GEORGE M. BERNARD
Serial or Patent No.: _____
Filed or Issued: _____
For: IMPROVED TRACKING, PROPULSION AND BRAKING SYSTEM FOR BRIDGE TRIPPER/HOPPER CAR

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) and 1.27(b)) — INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled IMPROVED TRACKING, PROPULSION AND BRAKING SYSTEM FOR BRIDGE described in TRIPPER/HOPPER CAR

the specification filed herewith
 application serial no. _____, filed _____.
 patent no. _____, issued _____.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant convey, or license any rights in the invention is listed below:

no such person, concern, or organization
 persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME _____
ADDRESS _____

INDIVIDUAL

SMALL BUSINESS CONCERN

NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____

INDIVIDUAL

SMALL BUSINESS CONCERN

NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____

INDIVIDUAL

SMALL BUSINESS CONCERN

NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Ronald R. Kelly
NAME OF INVENTOR

Signature of Inventor

George M. Bernard
NAME OF INVENTOR

NAME OF INVENTOR

Date

Aug 5, 1998

Date

Aug 6, 1998

Date

Signature of Inventor